

April 2004 Report of the Tevatron BPM Upgrade
wbs item 1.3.4.6.4
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May 7, 2004

Project Manager's Summary:

Work progressed on all aspects of the project in April. A much clearer view of the installation and commissioning schedule is now in hand and the project will rebaseline in early May to reflect installation of the new hardware during the 2004 shutdown and commissioning of the systems once the beam returns in November 2004.

The first four modified EchoTek receiver boards are due in June. Work to prepare the test stand for proper test of the modified boards to verify changes and functionality is headed up by Dehong Zhang with assistance from others in the project as needed. This is a key activity. The project will have to validate the changes and work with EchoTek to keep the project on track to receive the production boards beginning in August 2004.

The design of the analog front end of the system continues. Both the timing card and the front-end/diagnostic card designs are progressing. The 53 MHz band pass filter specification has been finalized. The schedule for the front end boards is quite tight and some attention will be paid to this part of the project to keep it on track.

Preparation for installation continues and progressed nicely. The project has chosen a location for the new TeV BPM electronics, has a plan for installation during the shutdown, and is working on cable routing and other changes in the service buildings. Any work that can be accomplished before the shutdown (e.g., moving the pbar cables to the correct rack) will occur as soon as possible with help from AD and CD technicians.

All of the software specifications and designs are moving forward. Coding is proceeding on the front-end software. The online and offline software are not yet so far along. These are not expected to be a problem but progress will continue to be monitored.

A new task, "Hardware and software integration", will be added to the project. The goal will be to bring together production components and prototypes in a test of the full system. This will allow the project to test that all of the components function together properly and to find and solve any integration issues that will undoubtedly arrive. No hard schedule for this integration milestone has yet been decided but this should occur soon.

Measurements with Recycler style EchoTek boards continue. 53 MHz filters with a wider band pass have been used to measure pbar positions using the "Plan B" or "short gate sampling mode", i.e., collecting signals only when pbars are in the pickups. The results are quite encouraging and the project has decided to design for both antiproton measurement techniques.

Discussions of diagnostics and calibrations have begun. A much clearer view of each of these has emerged. Diagnostics in particular will need some serious attention in the near future from the project to properly define them and to organize effort to write the necessary applications.

A special meeting was held with the BLM upgrade project to discuss interfaces, transition plans, etc. on April 5. The BLM project was reviewed later in the month and there are open questions about the impact of the BLM upgrade on the BPM project. We expect the issues to be clarified and decided soon.

Resources Used in April 2004:

The total number of FTE-months devoted to the project in calendar April 2004 from the Computing Division was reported to be 7.4 FTE-months with 14 people contributing. The total number of FTE-months devoted to the project from the Accelerator Division was 1.95 FTE-months with 5 people contributing. The total effort from both Divisions was 9.37 FTE-months. The following table gives the estimated or reported effort for both divisions (in FTE-months) since August of 2003.

Month	AD Effort	CD Effort	Total Effort
August, 2003	1.2	2.3	3.5
September, 2003	1.4	4.1	5.5
October, 2003	5.4	6.0	11.4
November, 2003	1.6	5.0	6.6
December, 2003	1.4	4.4	5.8
January, 2004	1.7	5.1	6.8
February, 2004	2.3	6.7	9.0
March, 2004	2.1	7.6	9.7
April, 2004	2.0	7.4	9.4

Purchase requisitions placed in April:

PO556325 was fulfilled on 4/27/04 for twelve 53 MHz bandpass filters for pbar signal separation demo at the cost of \$1,680.00

Orders placed:

PRN48421 was placed on 4/29/04 to purchase 10 Phase-Lock Loops for the Timing Board prototypes at the cost of \$950.

Milestones:

The project had no DOE milestones in April.

Meetings held, Reports Given:

Meetings were held in April on the following dates:

Project Meetings: April 1, 7, 8, 12, 14, 15, 21, 22, 26, 29

Special meeting with BLM project: April 5

Documents:

The following documents were written and added to the Accelerator Division Document Database in April:

[Beams-doc-1114-v4 Test the Modified EchoTek Board Dehong Zhang et. al.](#) 30 Apr 2004

[Beams-doc-1149-v1 The Quadratic Term in the Tevatron BPM Sum Signal Robert K Kutschke](#) 29 Apr 2004

[Beams-doc-792-v5 Minutes from the Tevatron BPM Upgrade Project Meetings Steve Wolbers et. al.](#) 28 Apr 2004

[Beams-doc-1065-v5 Tev BPM VME Hardware Specifications Vince Pavlicek](#) 22 Apr 2000

[Beams-doc-1134-v1 Dependence of BPM Resolution on Time During a Store Robert K Kutschke](#) 21 Apr 2004

[Beams-doc-1133-v1 Tevatron Front-End Software Design Review Luciano Piccoli](#) 20 Apr 2004

[Beams-doc-1124-v1 Separating Pbars by Time Robert K Kutschke](#) 20 Apr 2004

[Beams-doc-1067-v14 Tevatron BPM Software Design Luciano Piccoli et. al.](#) 16 Apr 2004

[Beams-doc-1060-v3 Tevatron BPM Online Software Specification Brian S. Hendricks](#) 16 Apr 2004

[Beams-doc-1118-v1 Summary of Service Building Survey for Tevatron BPM Upgrade Marv Olson](#) 12 Apr 2004

[Beams-doc-1116-v1 Commissioning Outline for Tevatron BPM Upgrade Jim Steimel](#) 12 Apr 2004

Beams-doc-1101-v1 Tevatron Beam Position Monitor Upgrade Offline Software
Specification Robert K Kutschke 01 Apr 2004

Subproject Leader Reports:

Technical Coordinator: Jim Steimel

The effort for this month has focused on coming up with a baseline commissioning plan with time and labor estimates. An outline of the plan was created and reviewed by the project managers. A more thorough project document that illustrates schedule dependencies and labor resources is nearly complete. Some of the work required in the commissioning plan has already been organized. Task forces for moving the pbar cables and connecting the pbar cables in the tunnel have already been formed. Data from the BPM wire measurement studies and beam position grid studies have been analyzed, and a first draft of the calibration specifications was presented and will be published early next month.

Requirements: Mike Martens

Pushpa Bhat formed a committee to review the specifications for an upgraded Tevatron Beam Loss Monitor (BLM) system. The committee consisted of Mike Martens (Chair), Jerry Annala, Brian Hendricks, Nikolai Mokhov, Dean Still, and Bob Webber from the Fermilab Accelerator Division, Carl Bromberg from CDF, and Ron Lipton from Dzero. The committee met on April 19th, 2004 where Stephen Pordes, Al Baumbaugh, and Craig Drennan presented talks on the specifications, initial design, and cost and schedule estimates. The committee approved of the overall design of the BLM hardware and recommended the project be pursued further.

This impacts the BPM upgrade project because the original plan required the integration of the existing BLM hardware into the BPM upgrade “front ends.” With the proposed BLM upgrade, and its estimated completion in August 2005, it is no longer clear that integrating the BLM and BPM systems is the best option. Therefore the BLM review committee recommended that separating the BLM and BPM systems be considered. It is important that this option is considered and a choice made in a timely manner in order to prevent delays in the BPM and BLM projects and in order to avoid duplication of effort.

The full report of the committee can be found in the Beams Division document database server at [Beams-doc-1147-v1 Tevatron BLM Review Committee Report of the meeting on April 19th](#) April 28, 2004.

Electronics: Vince Pavlicek

For April, the Electronics group focused on the design of the timing and diagnostic modules. The timing module design had an internal engineering review that included section members not on this project. The layout is started and the firmware conversion of the existing firmware to this hardware is making good progress. The two major modules of timing firmware are half done. There is a 'medium' size VME interface conversion task

yet to go and then there are two new but simple firmware modules to write. The diagnostic board design progressed to being ready for a review in early May and parts for a prototype are ordered and will begin arriving soon.

Front-end/DAQ software: Margaret Votava

During April we finished as much of the front end design review as we could, had a review consisting of both on and off project reviewers (Charlie Briegel, Brian Hendricks, Jim Kowalkowski, and Duane Voy). The reviewers had valuable comments which will be incorporated back into the design resulting in an updated version in early May. The reviewers did note that there are big holes regarding calibration and diagnostic specification and design. We have started to write a test plan for acceptance testing of the modified Echotek boards in June. We have spent time in understanding of the test routines supplied by Echotek to verify that the board works properly.

Online software: Brian Hendricks

During this month, the online software specification was further refined. It was put up for approval with the knowledge that it will continue to evolve. I also met with Rob Kutschke to try to come to an understanding about the boundaries between online and offline software. We also began discussions about how to handle calculating and saving calibration parameters.

Offline software: Rob Kutschke

I continued studies of the test data taken with the modified Recycler Echotek board. These studies included a thorough study of the so-called, Plan B option, separating the Pbars by gating the measurement at times when there are no protons near the BPM. This study showed that the resolution on the proton position stays stable over the course of a store while the resolution on the Pbar position degrades over the course of a store. It also showed the how various systematic effects can produce different biases at different times during a shot.

Jim Steimel proposed that one could use the quadratic term in the A+B signal to determine the electric center of the BPM plates. I showed that this method promises a resolution of between 50 and 100 microns but that there remain systematic effects to be addressed. These systematic effects are not yet fully understood.

I had several discussions with Brian Hendricks about the draft offline software requirements document and have received feedback by email from other members of the group. These comments are now being incorporated into the document.